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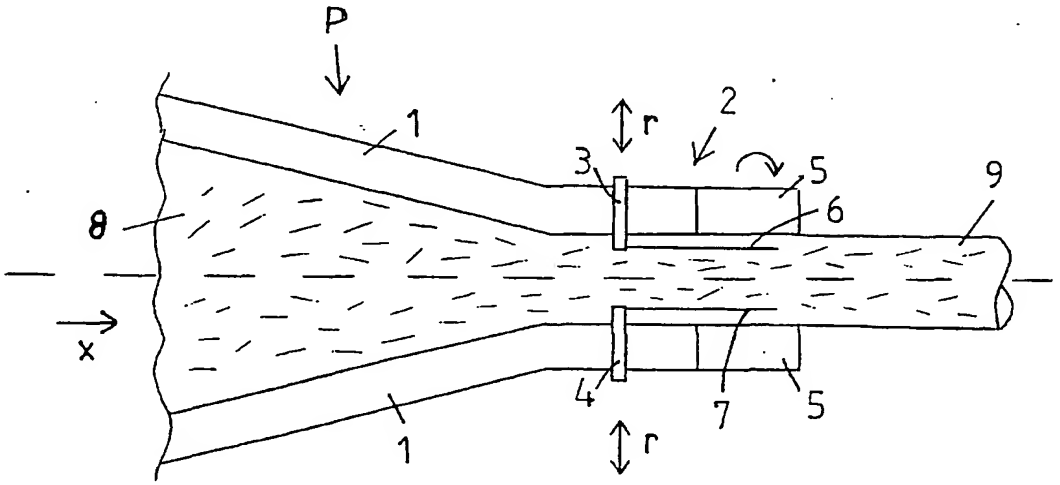
Erklärung gemäß Regel 4.17:
— *Erfindererklärung (Regel 4.17 Ziffer iv) nur für US*

[Fortsetzung auf der nächsten Seite]

(54) Title: EXTRUSION PRESS TOOL FOR PRODUCING A CYLINDRICAL BODY CONSISTING OF A PLASTIC MASS

(54) Bezeichnung: STRANGPRESSWERKZEUG ZUR HERSTELLUNG EINES AUS PLASTISCHER MASSE BESTEHENDEN ZYLINDRISCHEN KÖRPERS



(57) Abstract: The invention relates to an extrusion press tool for producing a cylindrical body (9) consisting of a plastic mass (8) and having at least one inwardly extending recess. Said extrusion press tool comprises an extrusion die (P) having a tapered region (1) and a die orifice (2) which forms a cylindrical channel. A number of filaments (6,7) corresponding to the number of inner recesses are fixed to a carrier device, or said carrier device comprises a number of channels corresponding to the number of inner recesses, for pressing a volatile filling material into the mass flow in the form of a filament. Said carrier device consists of a number of preferably rod-shaped carrier elements (3,4) corresponding to the number of inner recesses. Each carrier element (3,4) is fixed to the extrusion die (P) in the region of the die orifice (2) or in the tapered region and can preferably be adjusted in the radial direction.

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Washington, D.C. 20231

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Date 29 November 2004

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Extruder tool for producing a cylindrical body consisting of plastic mass

The invention relates to an extruder tool for producing a cylindrical body consisting of plastic mass.

An extruder tool for producing a hard-metal or ceramic rod with twisted internal bores is already known from DE 41 20 166 C2. The known extruder tool comprises an extruder nozzle, the mouthpiece of which has a smooth cylindrical channel. In addition, the known extruder tool is provided with a carrier which is arranged at a mandrel coaxially within the extruder nozzle and which has a number, which corresponds with the number of internal bores, of elastic threads protruding into the nozzle mouthpiece and/or channels or bores for threadlike pressing of a plastic material into the mass flow. These threads, channels or bores are fastened or arranged in correspondence with the position of the at least one internal bore at predetermined radial spacings from the axis. The carrier is constructed as a blade-free hub body. The hub body and/or the nozzle mouthpiece is or are associated with a drive device by which a predetermined relative rotational movement, which is matched to the extrusion speed of the mass, between the hub body and the nozzle mouthpiece can be produced for creating the at least one twisted internal channel in the extruded blank.

Moreover, a method and device for producing a sintered metal blank with internally disposed helical recesses is known from DE 199 42 966 C2. In that case the plastic body is initially produced with a substantially rectilinear course of the internal recess. The plastic body is thereafter cut off to a predetermined length and subsequently subjected to a rolling movement by means of a friction surface arrangement while being supported over its entire length on a bed. The speed of this rolling motion linearly and constantly changes over the length of the body so that the body is uniformly twisted.

The invention has the object of improving the production of a cylindrical body which consists of plastic mass and has a recess extending in the interior thereof.

This object is met by an extruder tool with the features indicated in claim 1. Advantageous refinements and developments of the invention are evident from the dependent claims.

The advantages of the invention consist particularly in that the radial spacing of the at least one internal recess of the cylindrical body consisting of plastic mass can be set quickly and in simple manner from the outer circumference or from the surface of the cylindrical body. Further advantages of the invention are evident from the following explanation of an example of embodiment by reference to the drawings, in which those components of an extruder tool which are necessary for understanding of the invention are illustrated, wherein:

Figure 1 shows a first example of embodiment for the invention,

Figure 2 shows a second example of embodiment for the invention and

Figure 3 shows a third example of embodiment for the invention.

Figure 1 shows a first example of embodiment for the invention. The illustrated extruder tool comprises an extruder nozzle P which has a tapering region 1 and a nozzle mouthpiece 2. The nozzle mouthpiece 2 forms a cylindrical channel. Plastic mass 8 is forced through this extruder nozzle in direction x so that the plastic mass leaving the nozzle mouthpiece forms a cylindrical body 9 consisting of plastic mass. This is then cut off to a desired length outside the extruder tool for formation of a blank. The blank is further processed to form an end product, for example a hard-metal rod, a ceramic rod or a powdered-steel rod, particularly a drill bit.

The cylindrical body 9 leaving the nozzle mouthpiece 2 has recesses helically extending in the interior thereof. If the end product is a drill bit, then these recesses serve as cooling channels through which cooling liquid is conducted to the cutting or working region of the drill bit during the drilling process.

Production of these helically extending recesses is carried out in a first form of embodiment of the invention with use of elastic threads and an end region 5 of the nozzle mouthpiece 2, which is constructed to be rotatable or rotating relative to the tapering region 1 of the extruder nozzle P.

Two resilient threads which are provided with the reference numerals 6 and 7 are shown in Figure 1. These resilient threads are each fastened to a respective thread holder 3 or 4.

The thread holders, which can consist of a metal, are each of pin-like construction and are guided through a bore in the nozzle mouthpiece 2 or a bore in the narrowing region 1 of the extruder nozzle and fastened thereto. They project into the cylindrical channel and are - as is indicated by the double arrow r - adjustable in radial direction. Through this adjustability the spacing of the respective internal recess, which arises by virtue of the threads during the extrusion process, from the surface or the outer circumference of the cylindrical body can be set in simple manner.

The cylindrical body 9 leaving the press tool accordingly has, in the case of the illustrated example of embodiment, two helically extending internal recesses.

The radial adjustability of the thread holders 3 and 4 is given either by a screwthread in the nozzle mouthpiece 2 or in the narrowing region of the extruder nozzle or by a setting drive. The radial adjustment can be undertaken by an operative.

The length of the threads 6 and 7, the length of the rotatable end region 5 of the nozzle mouthpiece 2 and the rotational speed of the end region 5 of the nozzle mouthpiece 2 are dependent on the respective case of use and can be optimised in dependence on the desired pitch angle of the helical internal recesses.

Figure 2 shows a second example of embodiment for the invention. This differs from the first example of embodiment in that a sensor 10 is provided outside or also inside the extruder nozzle. This sensor serves for detection or determination of the spacing of the internal recesses of the body from the outer circumference or surface thereof. The output signals of this sensor are fed to a setting unit 11 which provides setting signals s at its output. An automatic radial adjustment of the thread holders 3 and 4 is carried out by means of these setting signals s.

Figure 3 shows a third example of embodiment for the invention. According to this third example of embodiment a cylindrical body 9 consisting of plastic mass and having rectilinearly extending recesses in the interior thereof is produced by means of the extruder tool. In the case of this example of embodiment the nozzle mouthpiece 2 is of integral construction and does not have a rotatable or rotating end region. The cylindrical body 9 leaving the extruder tool is cut off to a desired length for formation of a blank. This blank can then be further processed to form a rod-shaped end product which has

rectilinear recesses. Alternatively thereto this blank can also - as is described in DE 199 42 966 C2 - be subjected to a rolling motion by means of a friction surface arrangement while being supported over its entire length on a bed, so that helical recesses are formed in the interior of the blank.

The parts of the thread holder elements 3 and 4 protruding into the cylindrical channel are preferably formed to taper at the inflow and/or outflow end in order to reduce the friction arising within the extruder nozzle.

The threads 6 and 7 are preferably provided at their ends with terminating members by which the diameter of the recess in the cylindrical body is determined. The cross-sectional area of the threads and/or the cross-sectional area of the terminating members can be round or non-round. This enables, for example, an optimum adaptation of the cooling channels of a drill bit to the chip spaces of the drill bit, which are formed in the drill bit in the course of further processing of the blank.

In the above examples of embodiment there was always described a carrier device, the carrier elements of which are thread holder elements to each of which a respective thread is fastened.

Alternatively thereto the carrier device can also comprise carrier elements which are provided with channels and through which volatile filler material can be pressed into the mass flow. These channels can also be formed to be round or non-round in order to predetermine the cross-sectional shape of the later internal recesses in desired manner. The volatile filler material is brought from outside through a feed duct into the channel of the respective carrier element. It serves as a form of space reservation for the later internal recesses and is removed from the internal recesses in a downstream process. For example, condensation of the filler material is achieved by heating, which filler material then flows out of the internal recesses without further changes in the shape of the cylindrical body then occurring.

Reference Numeral List:

1	tapering region of the extruder nozzle
2	nozzle mouthpiece
3	thread holder element
4	thread holder element
5	end region of the nozzle mouthpiece
6	thread
7	thread
8	plastic mass
9	cylindrical body
10	sensor
11	setting unit
P	extruder nozzle
r	radial direction
s	setting signal
x	extrusion direction